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RESEARCH NOTE

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RATE OF BROADCAST 2,4-D SPRAYING ON SECOND-YEAR CHAMISE SPROUTS

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Breaks in continuous brushfields to make fire control easier and safer are cleared at all seasons of the year. When brush is removed from the breaks in early spring, the plants soon produce new sprouts that grow rapidly for several weeks. If chemical control is delayed until the next spring, the sprouts often are too large for easy kill. Broadcast spraying with 2,4-D at application rates that control first-year chamise sprouts has often produced poor kill of the larger second-year sprouts. Adding 2,4,5-T to the 2,4-D has been reported as increasing the kill. This note reports a test of chemicals at greater than usual rates on an area burned in early spring on the north rim of Grindstone Canyon, Mendocino National Forest.

PROCEDURES

The test was conducted at an elevation of 3,500 feet on a wide ridgetop that was a good site for conversion of the heavy brush cover to light grass fuel. Average yearly precipitation was estimated at about 30 inches. The soil was Los Gatos stony loam 2 feet or more deep. Tractor equipment could be used on the moderate slopes.

The overmature chamise-chaparral was cleanly removed by burning in April 1956; perennial grasses with a small amount of annual brome were sown with a drill in September 1956; and the spray applied May 15, 1957 (fig. 1). At this time many of the sprouting chamise plants were 12 inches, or more, in height and new twig growth was 2 to 3 inches. Soil moisture remained adequate for plant growth for some time because of above average rainfall in May.

Both amount of chemical and volume of spray emulsion per acre were varied in four different rate treatments. A rate that commonly had been used for broadcast spraying, 2 pounds acid equivalent 2,4-D in

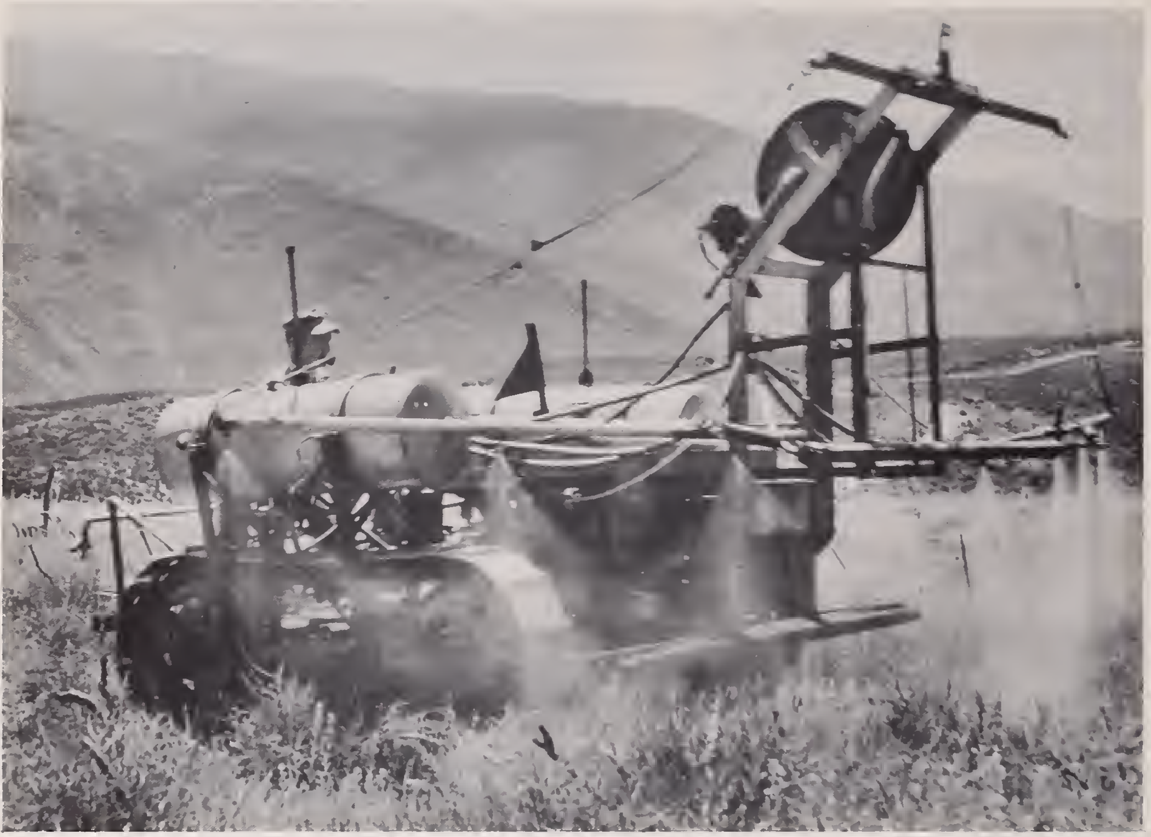

Figure 1.--Applying chemical spray on chamise plants burned the previous spring.

10 gallons emulsion per acre, was the base rate. Because the tractor spray rig traveled slower than its anticipated speed, the actual application was 2.6 pounds chemical in 13 gallons per acre. In a second treatment the same amount of chemical, 2.6 pounds, was applied in 26 gallons emulsion per acre. In the third treatment the chemical was doubled to 5.2 pounds and the volume held at 13 gallons. In the fourth treatment both were doubled, that is, 5.2 pounds in 26 gallons per acre.

Each of the 4 rate treatments was repeated with a 50-50 mixture of 2,4-D and 2,4,5-T, making a total of 8 different treatments.

Two blocks of 8 plots each were laid out, and within a block the plot treatment was selected at random. Each plot was 40 feet wide and 200 feet long.

The spray was applied with a 20-foot tractor-mounted boom. The 13-gallon-per-acre treatments were put on in one time over each plot; the 26-gallon treatments required two times over. The double pass may have given better kill than would have been obtained with a single pass at a heavy rate, but excellent distribution was obtained with either one or two passes.

Low volatile, butoxy ethanol esters of 2,4-D and 2,4,5-T were used. A quart of diesel oil was included in each 10 gallons of emulsion.

Effects of the spraying were sampled in August 1957 and June 1958 by recording the number of plants by degree of topkill on four temporary belt transects in each plot. Each transect was 100 feet long and 1/100 acre in area.

RESULTS

Of the 5,079 chamise plants occurring on the transects in 1957, only 17 percent were killed by the fire. The range was from 8 to 31 percent kill on the different plots. This is typical of the low fire-caused mortality resulting from early spring burning when the soil is moist.

Few seedlings were observed, which also is typical of early spring burns. Those that emerged in 1957 were killed by the spray, but part of the seedlings from seed that germinated in 1958 will survive.

Only those plants that produced sprouts after the fire were counted in evaluating the spray treatments.

An application of 2.6 pounds in 13 gallons of emulsion per acre was definitely too light for satisfactory kill of large, vigorous chamise sprouts. The average of 13 percent topkill in 1957 (table 1) included the smallest plants and a few weak large plants with an open growth-form easily penetrated by the spray material. By June 1958 the percent of plants completely topkilled averaged only 18.4.

The low volume application did not penetrate deeply into the dense crowns of the more vigorous plants. The dead leafage in 1957 was confined mainly to shoots growing above the main crown and to a shallow layer at the top of the densely intergrown crown vegetation. Below this layer most of the vegetation was green. By June 1958 more of the vegetation was dead, but the remaining part appeared to be sufficiently vigorous for recovery.

Doubling the volume of spray material (2.6 pounds in 26 gallons emulsion) produced better penetration into the crown and doubled the average number of topkilled plants, but did not give adequate control. The zone of dead leafage was considerably deeper into the crown than for the lighter application rate, with at least 40 percent of the crown dead on most plants. The percentage of plants completely topkilled increased materially from 1957 to 1958 but still averaged only 45.5 percent. Resprouting of partially topkilled plants increased noticeably by 1958 and the stand appeared to be recovering.

Doubling the amount of chemical (5.2 pounds in 13 gallons) appeared to be more effective than keeping the chemical at 2.6 pounds

Table 1.--Results from applying 2,4-D and a mixture of 2,4-D and 2,4,5-T at different rates on second-year chamise sprouts

Treatment	September 1957				June 1958			
	Sprouting plants 1/	Part topkill	Complete topkill	Topkill resprout	Sprouting plants	Part topkill	Complete topkill	Topkill resprout
	Number	- - -	Percent	- - -	Number	- - -	Percent	- - -
2.6 lbs.-- 13 gal./acre:								
2,4-D	256	84.2	15.2	0.6	239	64.3	19.0	16.7
2,4-D & 2,4,5-T	2/214	86.0	10.5	0.0	239	72.6	17.8	9.6
Average	235	85.0	13.1	0.3	239	68.4	18.4	13.2
2.6 lbs.-- 26 gal./acre:								
2,4-D	315	62.5	36.1	1.4	248	31.4	47.3	21.3
2,4-D & 2,4,5-T	287	63.9	34.2	1.9	214	34.3	43.5	22.2
Average	299	63.2	35.1	1.6	231	32.8	45.5	21.7
5.2 lbs.--13 gal./acre:								
2,4-D	278	60.4	35.3	4.3	226	19.9	61.3	18.8
2,4-D & 2,4,5-T	246	56.9	39.8	3.3	234	19.9	67.5	12.6
Average	262	58.8	37.4	3.8	230	19.9	64.5	15.6
5.2 lbs.--26 gal./acre:								
2,4-D	280	47.2	49.5	3.3	261	4.2	79.0	16.8
2,4-D & 2,4,5-T	223	47.8	47.9	4.3	194	7.2	82.7	10.1
Average	252	47.4	48.8	3.8	228	5.5	80.6	13.9

1/ Average number of plants in eight transects.

2/ Only 96.5 percent of the plants were included in this tabulation because 3.5 percent were missed by the spray.

and doubling the volume of emulsion. Effects in 1957 were about the same for each of the two rates. By June 1958 on the plots with doubled chemical content, a greater proportion of each chamise crown was dead and the percentage of plants completely topkilled was greater, averaging 64.5 percent. The plants appeared less vigorous with greater chance for further dying. Even so, the average number of living plants on the plots was 2,462 per acre. Probably these plots will require an additional broadcast spraying to bring the number down to the few that can be economically killed by hand treatment.

Doubling the rate of both chemical and volume of spray material (5.2 pounds in 26 gallons) produced the highest average degree of crown kill in 1957. By 1958, it was the only treatment that promised adequate results from a single broadcast application on vigorous sprouting plants. In 1957 the percentage of plants completely topkilled averaged 48.8, and most of the crown was dead on the remaining plants. By June 1958 dying had continued until virtually all of the original foliage was dead. Weak new sprouts were present on 13.9 percent of the plants. Although 80.6 percent of the plants were completely topkilled, an average of 1,222 plants per acre were still alive--too many for economical follow up by hand spraying. However, vigor was so poor that most of these plants could die later.

This study did not show an appreciable effect from replacing part of the 2,4-D with 2,4,5-T. The degree of kill, pound for pound, averaged about the same for 2,4-D alone as for the mixture of the two chemicals for each of the rate treatments (fig. 2).

DISCUSSION

Spraying on early spring burns should be done before the second growing season if perennial grasses are to be sown. Otherwise, the chamise sprouts during the second season will compete excessively with the grass seedlings (fig. 3). Spraying at a moderate rate in late June or July after burning in April, with another application the next spring should be economical and effective.

If for some reason spraying must be delayed until the second season, then a heavy application must be used on vigorous, dense-crowned chamise plants. This study indicates that about 6 pounds acid equivalent in 20 gallons of emulsion per acre will be needed. If the second-year chamise plants have open crowns or are otherwise of low vigor, a lighter rate should prove effective. In this test such open plants were killed with intermediate rates. Similar results were observed in tests made during 1958 in southern California.

Where chemical rate is increased to kill older chamise plants, it appears more economical to increase the amount of 2,4-D rather than adding the more expensive 2,4,5-T. Increasing the spray volume but not the amount of 2,4-D did not prove as effective as increasing amount of 2,4-D.

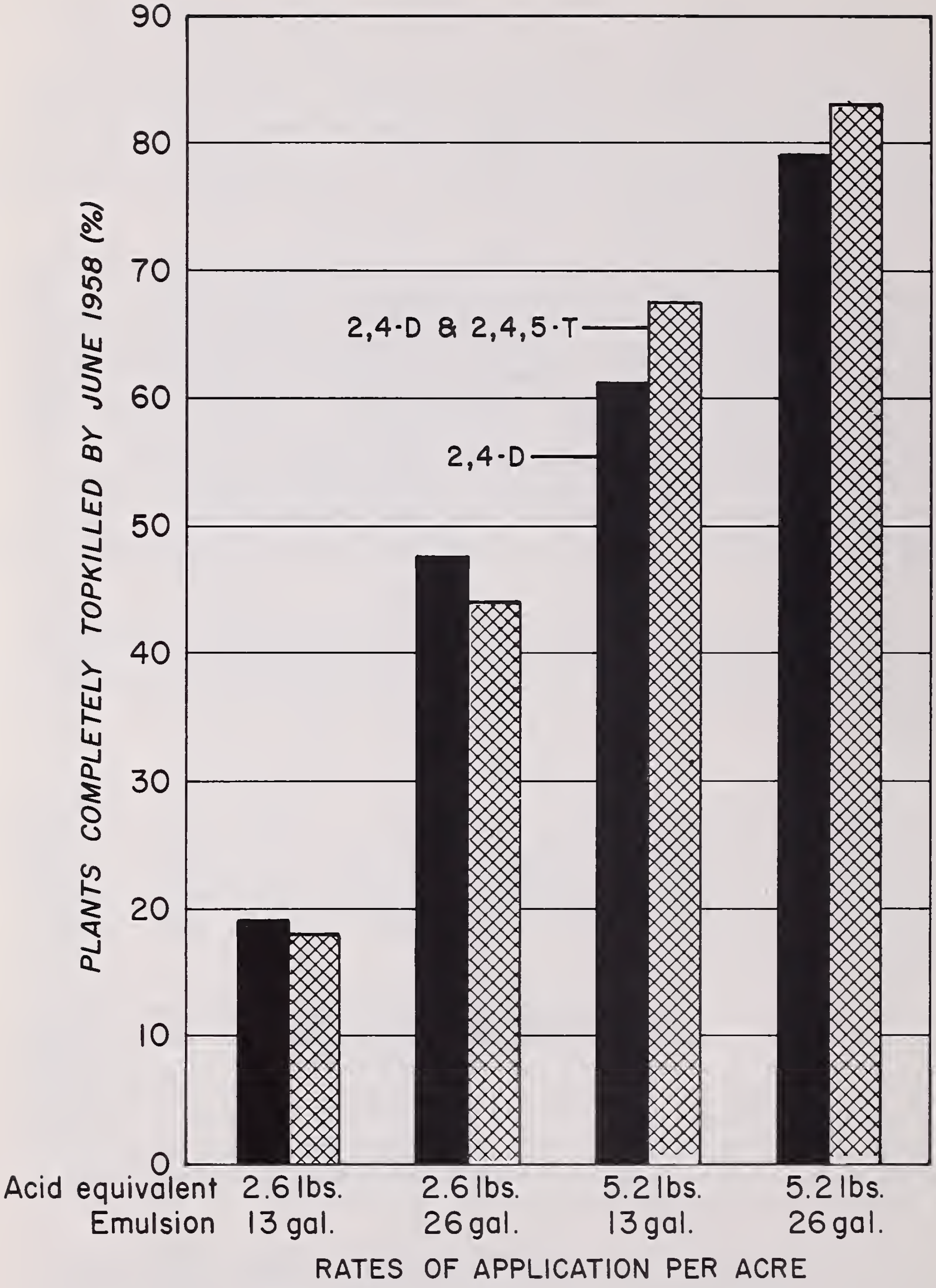

Figure 2.--Effect of rate of broadcast chemical application on second-year chamise sprouts.

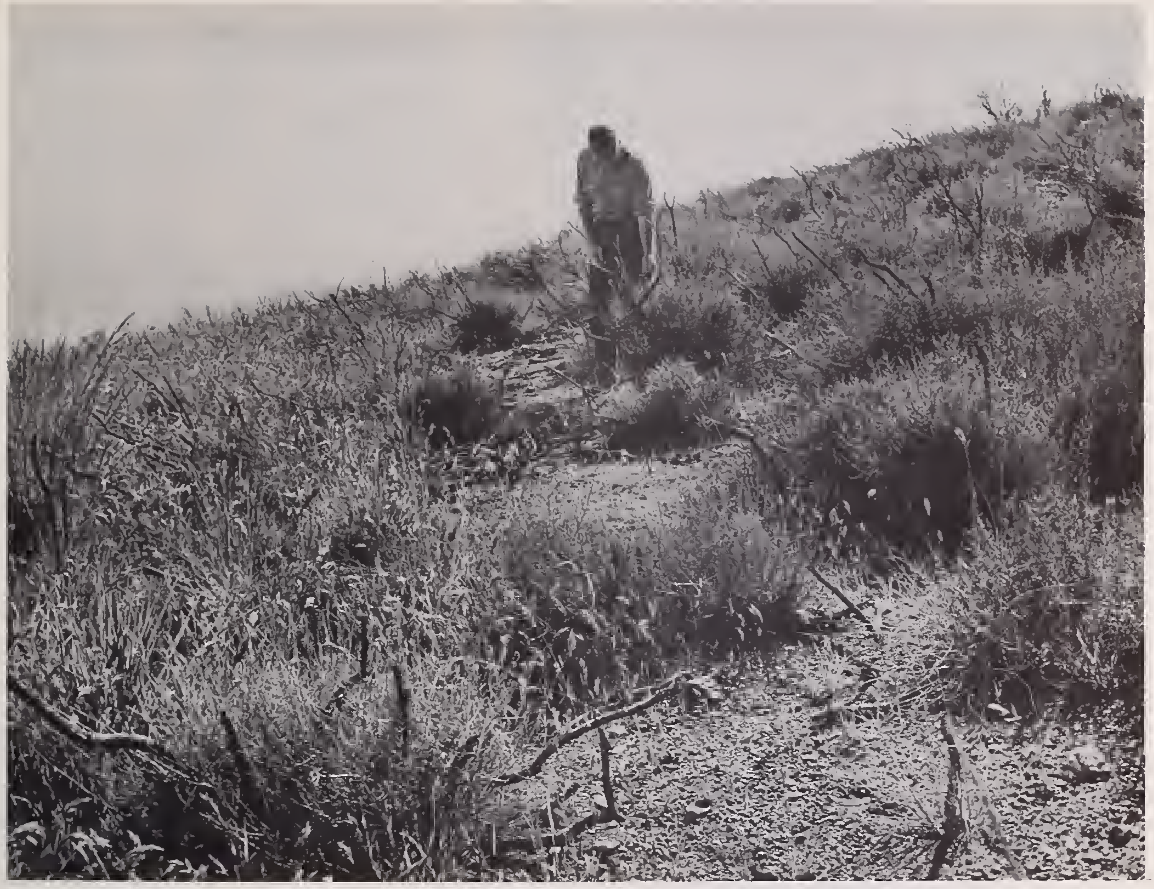

Figure 3.--On sprayed plot at left grass is well established by 1958, while unsprayed brush on right has prevented grass establishment.

SUMMARY

On an area burned in April 1956, chamise sprouts were sprayed with phytocides in May 1957--in their second year of growth. The sprouts were not effectively controlled by low-volume broadcast spray application. The heaviest rate used, 5.2 pounds acid equivalent of chemical in 26 gallons emulsion per acre, was the only one of four treatments that promised adequate kill of vigorous sprouting plants with dense crowns. Low volatile ester of 2,4-D alone appeared as effective pound for pound as a mixture of 2,4-D and 2,4-5-T.